

 Independent Verification & Validation Facility	Research Program	IVV 09-3 Revision: M Effective Date: June 08, 2005
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APPROVAL SIGNATURES		DATE
Gregory Blaney (original signature on file)	Management System Representative	06/02/2005

REVISION HISTORY			
Rev. No.	Description of Change	Author	Effective Date
Initial	Initial Release	Cynthia Calhoun IT/309	08/22/1997
A	Added 5.2 Process Verifications. Added NASA Policy Guideline NPG 1441.1 to References. Added section 8 (Metrics). Format and content changes.	Cynthia Calhoun IT/309	04/09/1998
B	Format changes	Cynthia Calhoun IT/309	05/05/1998
C	Added "Financial Management" section. Added references to 53.IT.0009-4 SLP in section 6.1.7.2. Modified sections 1.0, 6.1.2, 6.1.4.3, 6.1.7.1, 6.1.7.2, 6.1.7.3, 6.1.8, 6.2	Cynthia Calhoun IT/309	07/23/1998
D	Quality Record - format change	Cynthia Calhoun IT/309	08/26/1998
E	Revised the Resource Manager responsibility. Added the OSMA Annual Review Report, OSMA Software Program Level 1 Technical Program Plan, and OSMA Software Program Operating Plan as Quality Records. Updated Center Initiative Management	Cynthia Calhoun IT/309	04/16/1999

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	Process to reflect the changes in the Level 1 Technical Program Plan.		
F	References to Ames Quality Manual replaced with references to IV&V Facility Quality Manual	Cynthia Calhoun IT/309	09/10/1999
G	Reference to Process Verification Work Instruction (IVV 09-3-1) in section 6.2	Cynthia Calhoun IT/309	03/10/2000
H	Format and Number changes; Delete Reference to Ames Research Center	Griggs	12/06/2000
I	Rewrite of document to reflect refinement of procedure resulting from transfer to GSFC	Shandra Auvil	07/02/2001
J	Changed item 6.5	Wesley Deadrick	05/15/2002
K	Rewrite to reflect NRA and DDF scope additions	Frank Gmeindl	04/08/2003
L	Updated reference documents to include relevant standards. Evaluated and updated the metrics collected as a result of this process.	Wes Deadrick	11/03/2004
M	Aligned with current practice	Frank Gmeindl	06/08/2005

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REFERENCE DOCUMENTS	
Document Number	Document Title
	OSMA Software Program Level 1 Technical Program Plan
	OSMA Software Program Operating Plan
	Software Assurance NASA Research Announcement
IVV 09-3-1	Evaluating Research Initiatives
IVV 09-3-2	Selecting OSMA SARP Initiatives
IVV 09-3-3	Selecting IV&V Facility Research Initiatives
IVV 09-3-4	Processing Procurements for New Research Initiatives
IVV 09-3-5	Processing Research Deliverables
IVV 09-3-6	Conducting Research Initiative Performance Reviews
IVV 09-3-7	Publishing Research Results
IVV 09-4	Project Management System Level Procedure
IVV 16	Control of Quality Records System Level Procedure
NASA STD 8739.8	Standard for Software Assurance
NPR 1441.1	NASA Records Retention Schedules Flowchart
NPR 7150.2	NASA Software Engineering Requirements

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1.0 Purpose

The purpose of this System Level Procedure (SLP) is to establish guidance for defining and managing the Facility Research Program. It also describes the tools and processes utilized to provide continual process improvement of the Facility Research Program.

2.0 Scope

This SLP is applicable to the Facility Research Program. The research program consists of two parts: 1), the day-to-day oversight and management of the Software Assurance Research Program (SARP), sponsored by the Office of Safety and Mission Assurance (OSMA), and 2), the Facility's own internally funded research program.

This SLP addresses research program planning, research proposal solicitation, evaluation and selection, research initiative contracting, and research initiative management, including the management and publication of results.

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2.1 Research Funding

Figure 2-1 depicts the research program funding flow. Although the Facility manages the entire OSMA SARP, OSMA sends funds directly to NASA Centers. The funds that OSMA sends to the Facility are for Center Initiatives that the Facility conducts, University Initiatives that are performed by West Virginia University (WVU), and Facility management support.

NASA Corporate General and Administrative (G&A) funds the Facility to perform IV&V work. A portion of those funds go into the Director's Discretionary Fund (DDF) and are used to conduct research to improve IV&V.

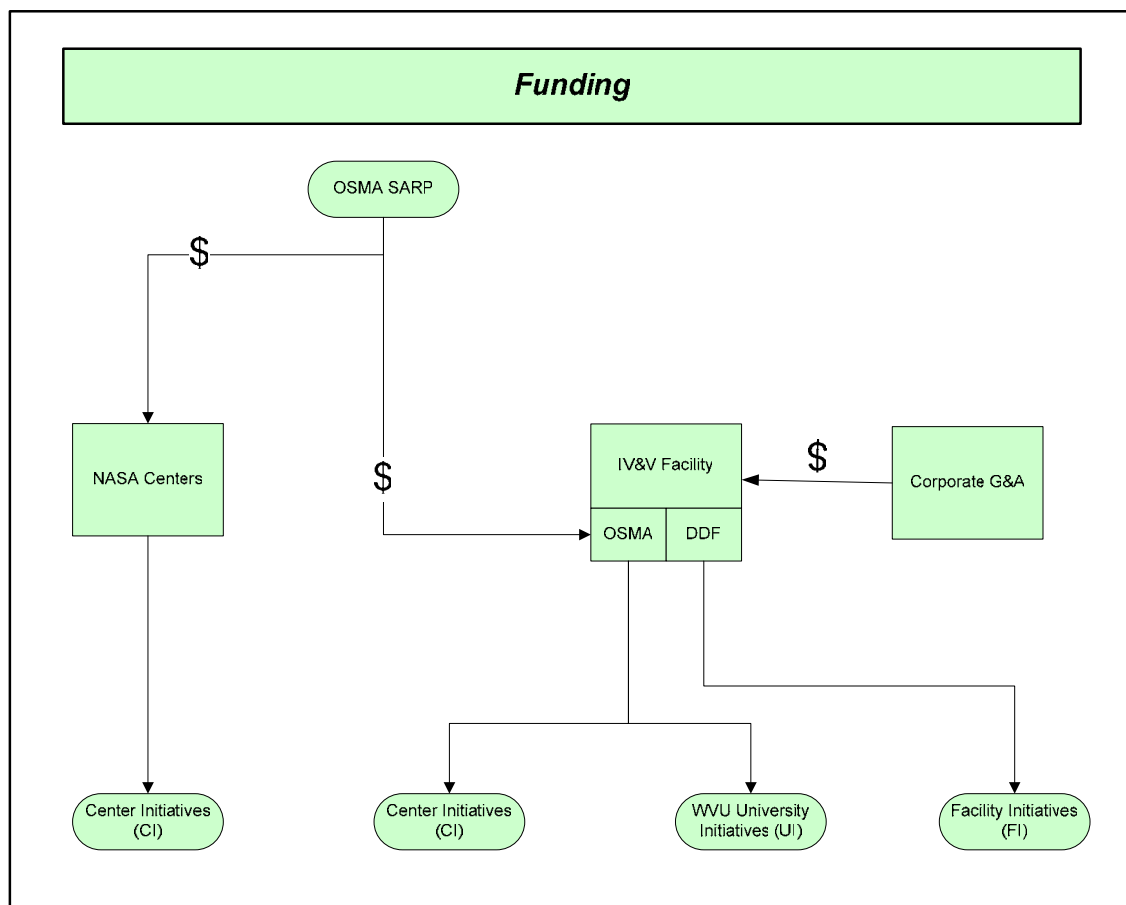


Figure 2-1: Research Funding Flow

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2.2 Types of Initiatives

The Facility manages, or has oversight of, three types of research projects:

1. Center Initiatives (CI) – OSMA SARP research conducted at NASA Centers or at the Facility
2. University Initiatives (UI) – OSMA SARP research conducted by WVU
3. Facility Initiatives (FI) – IV&V research funded by the DDF

2.3 Initiative Management Structure

The Facility Research Lead oversees all initiatives. Each initiative has a Government Point of Contact (POC) and a Principal Investigator (PI).

The Facility Research Lead provides oversight to Government POCs and PIs. The Government POC ensures that the PI's work products are accepted by NASA and are retained in the Center Initiative Management (CIM) Tool. The PI actually implements the research.

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2.3.1 IV&V Facility Management of the OSMA SARP

Figure 2-2 depicts the OSMA SARP Management Structure.

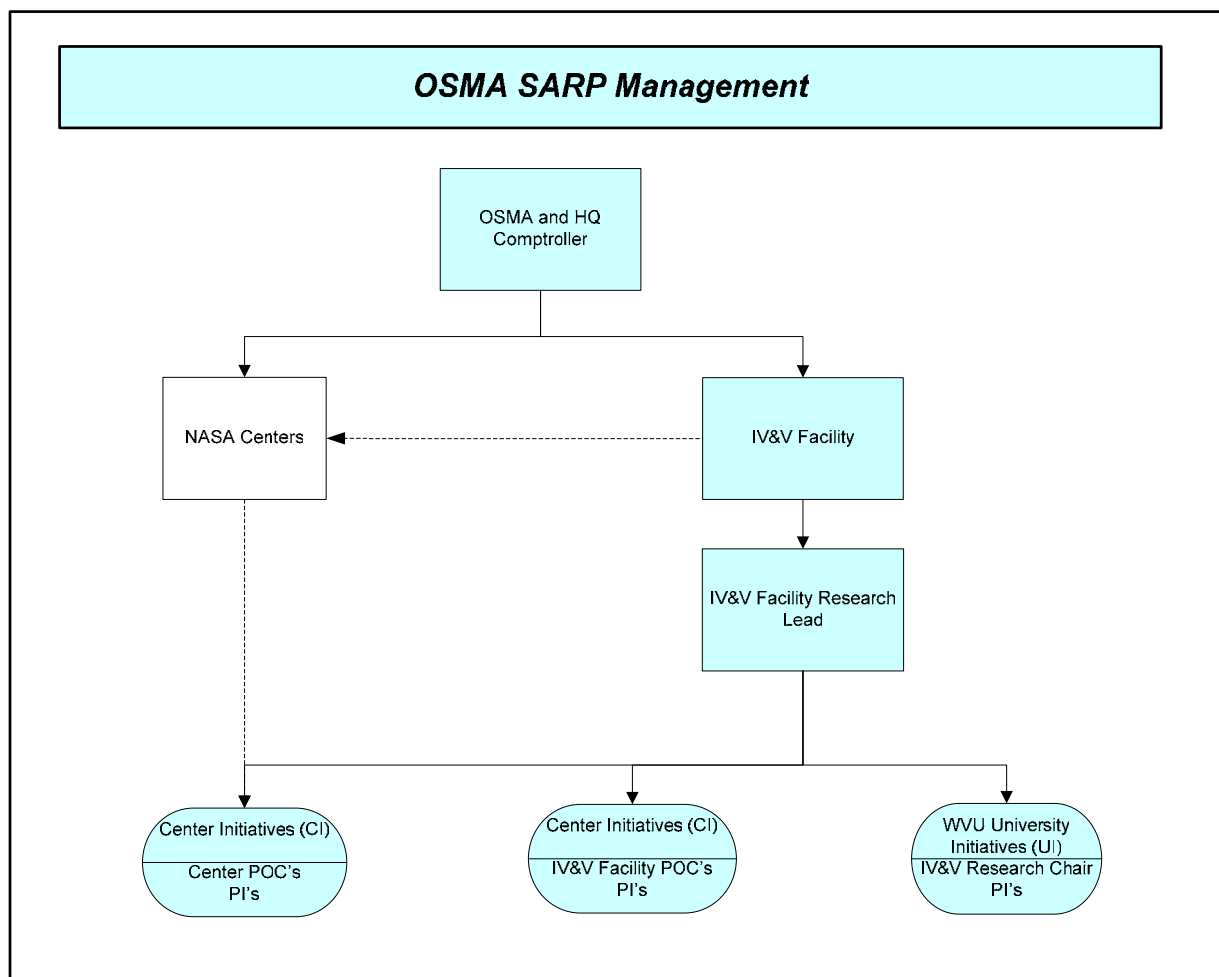


Figure 2-2: OSMA SARP Management

The Facility Research Lead is the Government POC for UIs.

All Government POCs are Government civil service employees or Jet Propulsion Laboratory (JPL) employees. Government POCs are located at NASA Centers, JPL, or at the Facility. The Government POCs for the initiatives are stationed at the location that their initiative is located. For example, if Goddard Space Flight

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Center (GSFC) has a research initiative on Code Inspection, the Government POC for that initiative would be located at GSFC.

Initiatives can be performed by NASA civil service employees, JPL employees, or contractors. If the initiative is performed by a contractor, the Government POC is usually the Contracting Officer's Technical Representative (COTR).

The NASA Centers and JPL have their own contracting offices. For the Facility, the GSFC procurement office administers grants and contracts. While the Government POCs for IV&V initiatives reside in the Facility, the Contracting Officer (CO) for IV&V initiatives resides at the GSFC.

PIs can be NASA civil service employees or contractors. PIs can be located at NASA Centers, JPL, the Facility, or at contractor sites.

2.3.2 Commonalities Between OSMA SARP and DDF Initiatives

Following are common features of the Facility's management of the OSMA SARP and DDF research.

- The CIM Tool is the data repository for all initiative proposals, contracts, deliverables, and progress reports.
- All initiatives have a designated Government POC and a PI.

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2.3.3 Differences Between OSMA SARP and DDF Initiatives

Figure 2-3 is a list of differences between the SARP and the Facility research initiatives.

	SARP Initiatives	Facility Initiatives
Selection Instrument	Level 1 Plan - POP call NRA	Unsolicited proposals
Selection Process	Source Evaluation Board	Director and NASA IV&V Research Lead
Management Structure	OSMA delegates day-to-day management to the Facility	IV&V Facility Director directs
POC locations	NASA Centers Facility	Facility only
Initiative types	CIs Uls	FIs

Figure 2-3: Differences Between SARP and Facility Initiatives

3.0 Definitions and Acronyms

3.1 Center Initiative (CI)

A CI is a project or task funded by the OSMA SARP and focused on software assurance and software improvement. CIs are generally research projects, but certain other projects may be termed CIs on a case-by-case basis. CIs may be conducted by a NASA Center, JPL, the Facility, or by another Government agency. CIs may also employ the services of a support contractor.

3.2 Center Initiative Management (CIM) Tool

The CIM Tool is a web-based data repository used by all program participants to manage initiative work products, including proposals, deliverables, and status reports.

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3.3 Customers

The primary customer for the SARP is the NASA Deputy Chief for Safety and Mission Assurance, located at NASA Headquarters (HQ). Other customers include:

- Researchers funded through this program
- NASA projects, software developers, and IV&V practitioners who benefit from advances in software assurance technology
- The general public accessing the results of this research

The primary customers of the DDF-funded research are IV&V practitioners and the software assurance community.

3.4 Facility Initiative (FI)

A FI is a project or task funded by Facility DDF and focused on developing IV&V tools and techniques. FIs are generally research projects, but certain other projects may be termed FIs on a case-by-case basis. FIs are conducted by universities or industry.

3.5 Government Point of Contact (POC)

A Government POC is a NASA civil service employee or JPL employee having the authority and responsibility to prepare, implement, and direct a specific research initiative. Each initiative will have a Government POC responsible for the effort. For research performed by a Government agency, the Government POC may also be the PI. For research performed by industry or academia, the Government POC is usually the Government COTR on the grant or contract through which the industry or academic research is funded.

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3.6 Level 1 Plan

A Level 1 Plan is a high-level plan that lays out objectives and processes for OSMA SARP selection and funding of CIs or UIs.

3.7 Level 2 Plan

A Level 2 Plan is a plan that establishes actual funding for approved CIs or UIs and other OSMA SARP activities.

3.8 NASA Research Announcement (NRA)

An NRA is a solicitation instrument used to obtain research proposals from universities and industry for the OSMA SARP.

3.9 Facility Research Lead

The Facility Research Lead is a NASA civil service employee at the Facility who provides oversight to Government POCs and PIs.

3.10 Principal Investigator (PI)


The PI is a lead researcher who actually conducts the research. If the PI is a NASA civil service employee, the PI may also be the Government POC. However, if the PI is from a commercial or an academic institution, the Government must appoint a separate Government POC.

3.11 Product

A product is a deliverable (either hard copy or electronic) produced by the PI. Typical products include plans, technical reports, software source code, and executable code.

3.12 Research Coordination Team (RCT)

The RCT is composed of key Facility Civil Servant and Contractor personnel who meet occasionally to review research requirements and facilitate research efforts.

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3.13 University Initiative (UI)

A UI is specific OSMA SARP-sponsored research conducted by WVU under a previously established cooperative agreement.

3.14 3.14 Acronyms

CI	Center Initiative
CIM	Center Initiative Management
CO	Contracting Officer
COTR	Contracting Officer's Technical Representative
DDF	Director's Discretionary Fund
FI	Facility Initiative
G&A	General and Administrative
GSFC	Goddard Space Flight Center
HQ	(NASA) Headquarters
JPL	(NASA) Jet Propulsion Laboratory
NPG	NASA Policy Guideline
NPR	NASA Procedural Requirement
NRA	NASA Research Announcement
OSMA	Office of Safety and Mission Assurance
PI	Principal Investigator
POC	Point of Contact
POP	Program Operating Plan
RCT	Research Coordination Team
SARP	Software Assurance Research Program
SAS	Software Assurance Symposium
SEB	Source Evaluation Board
SLP	System Level Procedure
SRWS	SARP Results Web Site
STD	Standard
SWG	Software Working Group
UI	University Initiatives
WI	Work Instructions
WVU	West Virginia University

4.0 Flow Chart

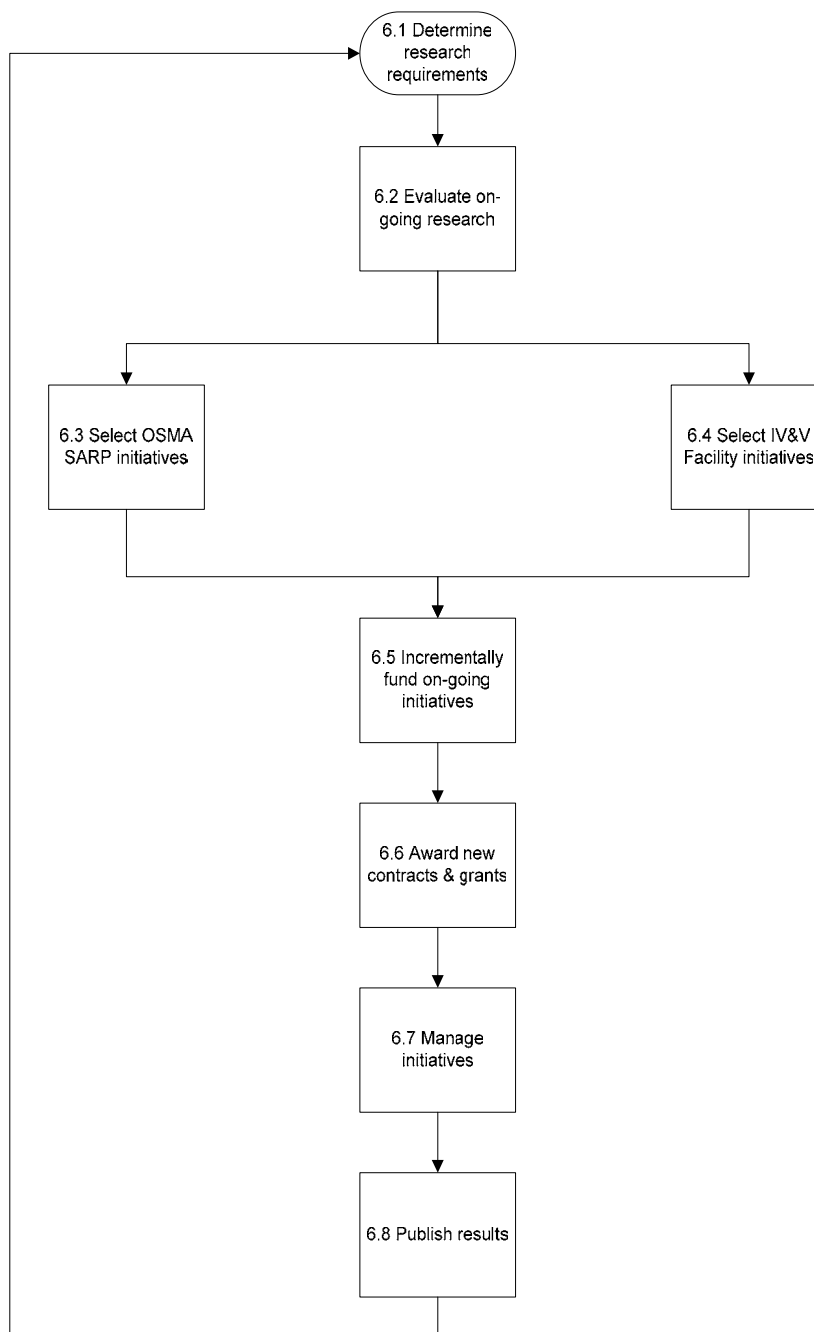


Figure 4-1: Research Program

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5.0 Responsibilities

5.1 OSMA

OSMA provides the funding and delegates the implementation responsibility for the OSMA SARP to the Facility. OSMA collaborates with the Facility to establish program direction, evaluate research, determine research objectives, determine initiative funding, and select new initiatives.

5.2 Facility

The Facility:

- Manages the SARP and its internally funded research program on a day-to-day basis
- Determines research needs and requirements, and provides recommendations to OSMA
- Evaluates on-going research and provides recommendations to OSMA for incremental funding
- Drafts research plans and facilitates the proposal solicitation, evaluation, selection, and award process
- Obtains and processes research deliverables to ensure that research objectives are attained and that research results are disseminated
- Ensures that research initiatives are properly administered and managed through Government POCs

5.3 NASA Centers

The NASA Centers:

- Identifies research needs and requirements
- Provides research proposals and proposal evaluations
- Incrementally funds on-going initiatives and awards new grants and contracts
- Manages research initiatives through Government POCs

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6.0 Procedure

This section describes the process steps represented in Figure 4-1: Research Program. This section also describes the key activities performed within each process step. Further descriptions of many of the steps are contained in WIs IVV 09-3-1, Work Instruction for Evaluating Research Initiatives, through IVV 09-3-7, Work Instruction for the Publication/Presentation of Research Results.

6.1 Determine Research Requirements

The Facility determines OSMA SARP research topics by querying NASA projects, NASA HQ personnel, and Software Working Group (SWG) personnel. The Facility determines Facility research topics by querying the Research Coordination Team (RCT). The RCT is a Facility organization consisting of both civil servants and contractors. The RCT meets periodically to review research requirements and facilitate research efforts. The Facility documents the research topics and posts them on the Facility web site each year in preparation for the annual proposal solicitation.

6.2 Evaluate On-going Research

The Facility conducts an annual evaluation of on-going research initiatives to develop funding recommendations for the following year. The annual evaluation is the culmination of numerous evaluations conducted during the year at quarterly reviews, the Software Assurance Symposium (SAS), and other interactions between the research team and NASA.

6.3 Select OSMA SARP Initiatives

Selecting OSMA SARP initiatives involves writing a program plan, soliciting proposals, evaluating proposals, and selecting proposals for award. The Facility drafts the Level 1 Plan and OSMA approves it. The Level 1 Plan serves as the basis for the internal NASA Program Operating Plan (POP) call for research proposals. If the Facility intends to solicit proposals from outside the Government (e.g., from industry or academia), it may plan to issue a NASA Research Announcement (NRA). In a given year, if the Facility determines that an NRA is needed, the NRA will be prepared in conjunction with and discussed in the Level 1 Plan.

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The NASA IV&V Research Lead is responsible for the formulation and conduct of the Source Evaluation Board (SEB). The Facility receives proposals, obtains evaluations from the SWG, and provides recommendations to the SEB.

The SEB recommends incremental funding for each on-going initiative based on the evaluations of on-going research initiatives. The SEB then recommends new awards based on the proposal evaluation results and the remainder of budgeted funds. OSMA selects proposals for award based on the SEB recommendations.

The Facility drafts the Level 2 Plan. As well as defining the funding levels for on-going initiatives, the approved Level 2 Plan serves as OSMA's selection of proposals for award.

6.4 Select Facility Initiatives

The Facility receives unsolicited proposals throughout the year. The NASA IV&V Research Lead and the Facility Director select for award proposals that offer the most benefit directly to the Facility. The unsolicited proposals that are selected for award are funded from the DDF.

6.5 Incrementally Fund On-going Initiatives

NASA Centers incrementally fund existing grants or contracts according to the guidance contained in the approved Level 2 Plan. GSFC procurement incrementally funds existing contracts or grants and awards new grants or contracts for the Facility. The Facility incrementally funds the WVU cooperative agreement for research.

6.6 Award New Contracts & Grants

The Facility completes technical evaluations and procurement requests to implement new initiatives for OSMA-funded and DDF-funded awards.

6.7 Manage Initiatives

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Managing initiative performance involves processing deliverables and conducting periodic performance reviews. The Facility, PIs, and Government POCs use the CIM Tool to manage deliverables, status reports, and performance reviews.

PIs conduct their proposed research and produce deliverables such as technical reports and software. Government POCs and the Facility review deliverables and accept or reject them.

The PI submits quarterly status reports to the Facility. The Facility conducts the quarterly review with the PI, the Government POC, and others. During the quarterly review, the participants review and discuss the submitted reports. The outcomes of the review can include program direction from the Facility and revision of the initiative.

The Facility also conducts informal reviews of the initiative with the research team. The formal and informal performance reviews provide data for Section 6.2, Evaluate On-going Research.

6.8 Publish Results

Research results are published at the annual SAS and on the SARP Results Web Site (SRWS).

Each year, all initiative PIs make a presentation at the annual SAS. This symposium is considered the annual report to the customers. The Deputy Chief for Safety and Mission Assurance is invited to attend and is given the opportunity to provide verbal feedback on the quality of the research. Additionally, surveys are passed out to assess the quality of the Symposium. Proceedings of SAS are posted on the SRWS.

The Facility publishes deliverables that will provide significant value to the software assurance community, as well as the software engineering community. The Facility publishes them on the SRWS. Prior to publishing results, the Facility ensures that appropriate public release authorization has been obtained.

7.0 Metrics

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The Facility uses the CIM Tool to track the planned vs. actual progress of initiatives. The CIM Tool maintains a database of proposals, evaluations, initiatives, deliverables, and reviews. The CIM Tool allows for the tracking and analysis of trends existing within the data points collected. The trend analysis is to understand where resources are being applied and with what results. The intent is to improve existing processes and continually revisit research focus strategies.

8.0 Records

The following records, as shown in Figure 8-1, are generated and managed in accordance with IVV 16, Control of Quality Records, and reference to NPR 1441.1, NASA Records Retention Schedules.

Document Name and Identification Number	User Responsible for Record Retention	Retention Requirement	Location
OSMA SARP Level 1 Technical Program Plan	Research Lead	Destroy 3 years after Project Life	Project File
Software Assurance NASA Research Announcement	Research Lead	Destroy 3 years after Project Life	Project File
Proposal Evaluation Plan	Research Lead	Destroy 3 years after Project Life	CIM Tool Archives
Proposals	Research Lead	Destroy 3 years after Project Life	CIM Tool Archives
OSMA Software Program Level 2 Operating Plan	Research Lead	Destroy 3 years after Project Life	Project File
Letter of approval for CIs and UIs	Research Lead	Destroy 3 years after Project Life	Project File
Grants and Contracts	Research Lead	Destroy 3 years after Project Life	Project File
Approved CI/UI/FI Deliverables	Research Lead	Permanent	Project File

Figure 8-1: Records Generated and Managed